

## ***Cactoblastis cactorum* Report for April-May-June 2007**



For past reports and more information, see the PPQ Cactus Moth website at: [http://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/cactoblastis/index.shtml](http://www.aphis.usda.gov/plant_health/plant_pest_info/cactoblastis/index.shtml)

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Also, please consult the Mississippi State University “Cactus Moth Detection and Monitoring Network” website with their monthly activity reports posted:  
<http://www.gri.msstate.edu/research/cmdmn/>

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**INTERNATIONAL CACTOBLASTIS CACTORUM CONFERENCE.** The conference, held May 8-10<sup>th</sup> at the Desert Botanical Garden in Phoenix, Arizona, was a resounding success. We had 82 registered attendees from 6 countries. There was good communications and interactions among all the participants on issues relating to detection, research, and control programs in Mexico and the United States. As a result, new detection and outreach initiatives and control strategy proposals are now in the works. A meeting summary with the presentation abstracts is being prepared and will be available on the PPQ website and by CD in the next couple months after abstracts are received and translated.

**CONFERENCE CALLS.** A call was held with Michelle Walters of CPHST-Phoenix and the cactus moth team to discuss the possibility of and the approach for using mating disruption as part of an additional control technique for *C. cactorum* at the leading edge in Alabama. A vendor has provided pheromone dispensers for testing. Another call was held by Ken Bloem with various APHIS scientists to discuss ideas for additional work on artificial diet improvement.

**VISIT TO CALIFORNIA OPUNTIA GROWER.** Ken and Stephanie Bloem and Joel Floyd visited Dr. Peter Felker at the D’Arrigo Bros. Co. Farm in Salinas, CA to observe pruning and harvesting techniques for commercially grown *Opuntia* for possible use in the control activities in AI and FL.

**PROGRAM VISIT BY REGIONAL PROGRAM MANAGER.** John Stewart is the new Eastern Region cactus moth program manager. John visited the program office in Pensacola as well as Ft. Morgan, and Dauphin Islands with Joel Floyd, Jim Carpenter, Ken Bloem, and John Mass. A re-infestation in 2 areas was discovered at Dauphin Island, during the visit. These populations have now been eliminated.

**PPQ FIELD ACTIVITY.** Host removal activities continue at Bon Secour NWR, AL. A new technician, Lisa Gay Durrance, has been hired to participate in these activities. The Gulfport PPQ-CPHST lab continues to provide excellent assistance through Craig Hinton in trapping. Host removal assistance is also being provided to Stephen Hight and his crew at Dauphin Island and Little Dauphin Island, AL. Permission and concurrence was received in March from US Fish & Wildlife Service to remove additional host material using a front-end loader in the refuge and below the sea-wall. The operational program has removed total of 185 tons of host material during April, May, and June.

**SURVEY.** Pheromone lures were requested by USDA-PPQ in CA and NM for trapping surveys in those states. The AZ Dept. of Agriculture also requested lures and is using volunteers coordinated through the Arizona Sonora Desert Museum to check traps at nurseries in Tucson, AZ. Other states currently conducting surveys include Texas, Louisiana and Mississippi. The Texas A&M Rangeland Extension Agent is traveling the state recording visual surveys and conducting outreach. Mississippi State University's GeoResources Institute continues to work with various land agencies and NGO's to set up sentinel sites, including at Organ Pipe National Monument in AZ, and at the Nature Conservancy lands in several Gulf Coast areas. Richard Brown checked traps from Galveston, TX and found no *C. cactorum*. Dr. Brown also verified the ID of insects from 9 pheromone traps from Phoenix, AZ, and 12 from Grand Bay National Estuarine Reserve, MS. All were negative for cactus moth. Larvae found by Victor Madamba (Master Gardener) on Hog Island, Houston, TX were sent for identification and were identified as early instar of a native *Melitara* species.

**REGULATION.** Conditions for shipment of nursery stock from infested states were developed as the result of a report by the Technical Panel on *Opuntia* Nursery Stock. In addition, pesticide labeling issues were researched by APHIS Environmental Services staff. Conditions were forwarded to the APHIS Regulatory Analysis Development staff for inclusion in the rule.

**TECHNICAL LIAISON:** Stephanie Bloem collected and compiled all reports for program activities and helped facilitate communication with SAGARPA on a number of occasions.

**George Schneider, FDACS-DPI, Gainesville, FL**

**Accomplishments and activities.** Latest pupal production for cladode reared larvae (infested on 2/15/07) was 29.21%. This is the best pupal production we have managed thus far. We feel that the smaller cladodes have been an important reason for this improvement. Fifty eggsticks were placed on artificial diet in mid-April and we are still collecting pupae from this group. We experienced an initial loss of several containers when larvae were early instar, however the remaining containers have shown little mortality. Time to pupation appears to be longer than in cladode rearing, but we are expecting that the final production will be equal or higher than in this production system. One hundred eggsticks (USDA-ARS Tifton) were placed on artificial diet on 6/5/07 and 6/15/07. A small collection of wild eggsticks was made in South Florida by a Division

inspector and these have been set-up on artificial diet. All adult eclosion cages have been screened and the environmental chamber that will contain them has been placed in the warehouse adjacent to the BCRF. The AC units for all the environmental chambers have been ordered and the unit for the adult colony has been installed. The moth scale collection unit is in its final phase of production. The incubator for holding eggsticks has arrived and is in operation. Three additional environmental chambers have been purchased; two will be used for holding artificial diet rearing and one for pupal emergence. Shelving for additional larval chambers has arrived and 50% of it has been assembled. An additional 1,000 larval rearing containers have been purchased and will be modified for use. Data loggers, diet ingredients, and a beeswax kettle for coating the artificial diet blocks with wax have been received. A work plan and budget for the continuation of the cooperative agreement for FY 07/08 has been submitted and approved by USDA-APHIS.

**Stephen Hight, USDA-ARS, Tallahassee, FL**  
**Jim Carpenter, USDA-ARS, Tifton, GA**

**SIT VALIDATION/VERIFICATION.** Traps were serviced at least weekly during April, May, and June at all study sites (Pensacola Beach, FL, Ft. Morgan, AL, Dauphin Island, AL, and Little Dauphin Island, AL) (Table 1). A few captures were made at Dauphin and Little Dauphin Islands. These males were likely a mixture of local infestations and fly-over re-infestations from Ft. Morgan (approximately 3 miles away). Marked, irradiated males released at Ft. Morgan have been found in Dauphin Island traps during previous flight periods. Pupae surviving removal of infested plants over the winter, likely re-infested the area. The spring flight period ended in late May (Pensacola Beach) to early June (Ft. Morgan). The summer flight period began about one month later; late June at Pensacola Beach and early July at Ft. Morgan. Releases of sterile *C. cactorum* were made twice per week at both Ft. Morgan and Little Dauphin Island over a 7 week period (April through 3<sup>rd</sup> week of May) (Table 2). Weekly recapture information at Ft. Morgan is presented in Table 3 and Figs. 1 and 2. Sanitation was conducted on Dauphin and Little Dauphin Islands during this period. Nearly 15 tons of cacti were hand removed, primarily from Little Dauphin Island. Material removed consisted of pads and plants damaged by weather, excess pads from sentinel plants, entire host plants and infested pads.

Table 1. Wild *Cactoblastis cactorum* (Cc) caught in traps.

April				
Location	Dauphin Is., AL	Little Dauphin Is., AL	Ft. Morgan, AL	Pensacola Beach, FL
# Traps	53	5	16	69
# Wild Cc	7	6	676	405
Avg. # Wild Cc/Trap/Month	.03	.3	10.6	1.5
May				
# Wild Cc	1	0	171	227
Avg. # Wild Cc/Trap/Month	0.004	0	2.1	0.7
June				

# Wild Cc	0	0	1	8
Avg. # Wild Cc/Trap/Month	0	0	.02	0.03

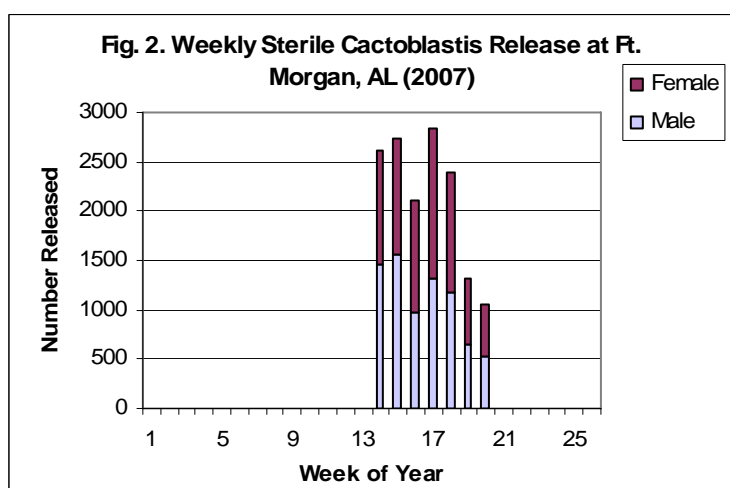
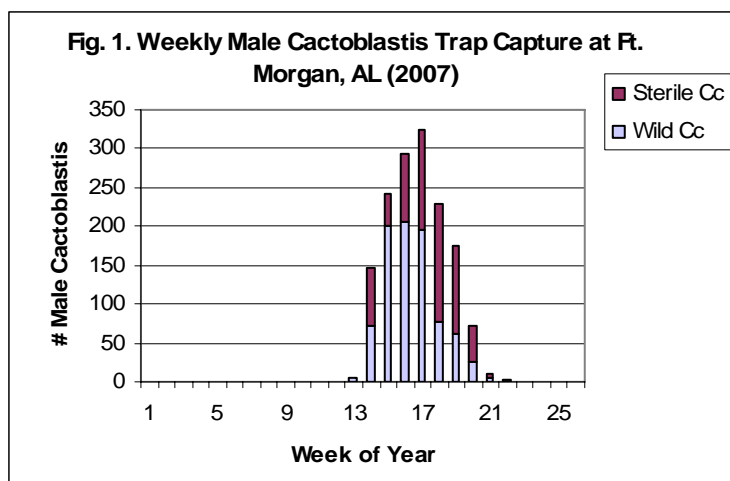
Table 2. Release totals of sterile *Cactoblastis cactorum* made at three Alabama sites.

April			
LOCATION	NUMBER OF STERILE Cc RELEASED		
	♂	♀	TOTAL
Ft. Morgan, AL	5,333	4,958	10,291
Little Dauphin Island, AL	3,778	2,892	6,670
Dauphin Island, AL	0	0	0
May			
Ft. Morgan, AL	2,357	2,420	4,777
Little Dauphin Island, AL	943	994	1,937
Dauphin Island, AL	0	0	0

Table 3. Weekly male *C. cactorum* (Cc) trap capture, number of male and female sterile moths released, and % sterile males released that were recaptured at Ft. Morgan, AL, April - June 2007.

MONTH	WEEK OF YEAR	Cc CAPTURED		STERILE Cc RELEASED		% STERILE ♂ Cc RECAPTURED
		WILD ♂ Cc	STERILE ♂ Cc	♂	♀	
January	2	0	--	--	--	--
February	9	0	--	--	--	--
March	11	0	--	--	--	--
March	12	1	--	--	--	--
March	13	5	--	--	--	--
April	14	73	74	1,468	1,145	5.0
April	15	202	39	1,566	1,173	2.5
April	16	205	88	978	1,124	9.0
April	17	196	127	1,321	1,516	9.6
May	18	76	153	1,175	1,224	13.0
May	19	62	114	658	667	17.3
May	20	27	44	524	529	9.5
May	21	5	5	0	0	*
May	22	1	1	0	0	*
June	23	1	0	0	0	--
June	24	0	0	0	0	--
June	25	0	0	0	0	--
June	26	0	0	0	0	--

\* Sterile males captured during these weeks included in previous week of sterile release.



**ECOLOGICAL AND QUALITY CONTROL FIELD STUDIES.** Flight Studies (collaboration with Prof. Silvia Dorn and Dr. Mark Sarvary). A visit was made to the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, to evaluate progress, assist in research, and participate in manuscript preparation. Project discussion also occurred at the International *C. cactorum* Conference in Phoenix, AZ. Experiments to evaluate the flight potential of different generations of *C. cactorum* are underway at ETH. Pupae resulting from overwintering late instar larvae collected in March were sent to ETH. A total of 2,047 wild pupae (1,067F:980M) were shipped to ETH. Late instar larvae inside cactus pads were collected in late June at the same naturally infested site in Florida. The infested pads were placed in screened wooden boxes in an outdoors location and will be held until they pupate. Pupae will be collected weekly, de-silked, sorted by gender and shipped to ETH for adult flight evaluations.

**REARING.** Cladode rearing. See Table for production figures for April, May and June.

	Eggs collected	Larvae placed cactus	Pupae collected	Adults
April	134,321	132,954	78,420	47,052

May	128,626	203,876	59,327	30,664
June	293,887	86,635	40,511	24,307

Shipments of pupae to ETH Zurich: 1,200 in April, 1,691 in May

Shipments of pupae to USDA-ARS Miami: 1,850 in April, 2,000 in May, 2,000 in June

Artificial diet rearing and diet trials. Eggsticks from South Africa (received Feb. 2007) were reared on artificial diet. Using the new rearing protocol, single eggsticks were placed in each rearing container. Any diseased container was discarded. Female pupae obtained were sorted by size and placed into separate colonies. Oviposition cages were set up with two size-classed females. Results show good results from the large diet-reared females.

### **1<sup>st</sup>. Generation large female study**

#### **Cage 1 with 50 males and 50 females**

Mean wt. of males = 0.070g.

Mean wt. of females = 0.180g. (range 0.160-0.232g.)

Eggs collected = 5,092

Eggs per female = 101.8

#### **Cage 2 with 59 males and 59 females**

Mean wt. of males = 0.085g.

Mean wt. of females = 0.181g. (range 0.160-0.232g.)

Eggs collected = 6,460

Eggs per female = 109.5

#### **Cage 3 with 52 males and 52 females**

Mean wt. of males = 0.093g.

Mean wt. of females = 0.194g. (range 0.165-0.276g.)

Total eggs collected = 5,000

Eggs per female = 96.0

**ADDITIONAL ACTIVITIES.** Trapping Beyond Leading Edge Trapping supplies were sent to various collaborators who continue monitoring traps for *C. cactorum*. These include: Grand Bay National Estuarine Research Reserve, MS, APHIS-PPQ, NM, AZ Department of Agriculture and APHIS-PPQ, CA.

**S. Dorn, M. Sarvary, ETH, Zurich, Switzerland**

### **Dispersal Studies.**

- Data analysis and interpretation on *Cactoblastis* flight performance (project phase 1A) continued intensively.
- Dr. S. Hight visited our laboratories mid-April. He was involved in the finalization of the manuscript 1A and in the preparation of experiments.
- The manuscript: "Diel Flight Pattern and Flight Performance of *Cactoblastis cactorum* (Berg) Measured on a Flight Mill: The Influence of Age, Gender, Mating Status and Body Size" by M. Sarvary, K. Bloem, S. Bloem, J. Carpenter, S. Hight and S. Dorn has been submitted to a refereed journal.

- Presentations by S. Dorn and M. Sarvary at the recent International Conference in Phoenix, AZ, focused on explaining the usefulness and significance of Laboratory Flight Performance Studies in understanding cactus moth dispersal capacity and on expected consequences for SIT programs. Intense exchange with other participants contributed much to the follow-up project phase 1B.
- The objective of phase 1B is to test the hypothesis that flight performance differs between overwintered and non-overwintered *C. cactorum*. Flight experiments with overwintered field collected moths were conducted in April. As overwintered and non-overwintered field collected moths cannot be tested simultaneously, laboratory reared moths shipped alongside wild moths were and will be used as a control. Comparisons between wild and laboratory reared populations are, in addition, of direct interest to SIT programs.
- Data analysis and interpretation of flight performance of overwintered *C. cactorum* has continued. Influence of age and mating status on flight performance was tested on overwintered field collected moths, while laboratory-reared moths from the same shipment were used as controls.

#### **R. Heath, N. Epsky, USDA-ARS-SHRS Laboratory, Miami, Florida**

**Accomplishments and activities.** Nine shipments of female pupae were received from Tifton. At the suggestion of collaborators in Tifton, we added humidity to emergence cages using wet sponges. Cages are referred below as “wet (W)” cages versus “dry (D)”. Wet sponges were used for subsequent cages to aid in eclosion. Total number of females and percent emergence obtained were: 02 May – 500 females (31.2% emerged); 09 May – 508 females (24.61% emerged); 16 May – 500 females (38.4% emerged); 25 May – 477 females split to “wet” and “dry” cages (39.08%W and 24.69% D); 01 June – 492 females (4.47%W & 5.69% D); 08 June – 498 females (6.83% emerged); 12 June – 507 females (46.75% emerged); 20 June – 492 females (9.35% emerged); 29 June – 518 females (9.27% emerged).

Chemical analysis. Glands were excised from calling females and gland chemicals were extracted. The number of glands available depended on number of calling females and samples were collected only when at least 20 females were calling. Total number of samples and number of glands per sampled were as follows: 01 May – 25 glands; 07 May – 33 glands; 09 May – 24 glands; 10 May – 21 glands; 14 May – 37 glands; 23 May – 42 glands; 25 May – 29 glands; 31 May – 40 glands. GC/MS analysis, using large volume injection procedure, found results similar to those reported in January. That is, previously identified chemicals were found but in amounts lower than expected. It was also noted that a lower percentage of females were calling than expected, but the numbers were not quantified. Therefore, it was decided to use pheromone biosynthesis-activating neuropeptide (PBAN) to enhance pheromone production. This technique was used to identify the pheromone components currently used in the 3 component experimental attractant for cactus moth males. For these tests, samples were obtained from 15 PBAN-enhanced glands and 15 KCl-sham treated control glands. During May and June, there were 25 GS/MS runs in total. This includes standards, gland extracts from calling

females, and PBAN-enhanced/KCl control gland extracts. These GC/MS runs have not yielded additional pheromone components.